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OPERATION OF THE POWER INFORMATION CENTER

ANNUAL REPORT

NUMBER-6

Contract NASr-191

Period Covered

1 August 1965 to 31 July 1966

National Aeronautics and Space Administration
Washington, D. C.

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Performance of Secretariat Functions and
Information Exchange Activities in the
Advanced Nonpropulsive Power Field

Prepared by : Paul S. Balas

PURPOSE

Under the terms of this Contract, the Trustees of the University of Pennsylvania have operated the Power Information Center as an agency of the Interagency Advanced Power Group; as the technical information center for advanced power research, development and engineering; and as the secretariat to the Steering Group, the several Working Groups and separate Panels of the Interagency Advanced Power Group.

ABSTRACT

This is the third annual report submitted under the provisions of Contract NASr-191 as amended and covers the period 1 August 1965 to 31 July 1966. Three previous annual reports covering the operation of the Power Information Center (PIC) were submitted and cover the period 1 August 1960 to 31 July 1963 when the PIC operated under Department of the Army contracts.

The major services performed during the period covered by this report are summarized as follows:

Acts as the Secretariat of the Steering Group, and of the five Working Groups and four Panels of the Interagency Advanced Power Group (IAPG), by rendering technical and administrative support to these Groups.

Facilitates the exchange of technical information in the advanced nonpropulsive power area between scientists and engineers, both within the government and within industry, as directed by the Interagency Advanced Power Group.

Collects, publishes, and selectively distributes loose-leaf Project Briefs (information sheets) of government-sponsored contracts and tasks in the advanced nonpropulsive power field.

Maintains current, selective mailing lists for the distribution of information.

Maintains current lists of existing and proposed government contracts, programs, and plans in the power and associated area and selectively distributes such lists.

Collects, indexes, and maintains a file of reports on power research development, and engineering covering those programs on which project briefs have been published.

Maintains a retrieval system which provides ready access to the administrative data contained in the published project briefs.

Prepares quarterly letter reports and an annual report.

FACTUAL DATA

This portion of the report describes, in some detail, the major activities of the PIC during the period 1 August 1965 to 31 July 1966. Supporting information in the form of exhibits is also included.

Project Brief Processing

The IAPG and the PIC, in order to discharge a major portion of their information exchange function, have adopted the project brief as a means for accomplishing this purpose. For those who may not be familiar with the project brief format a copy is included as Exhibit A of this report.

During the period covered by this report, these project briefs were distributed to a mailing list that averaged 740 separate addresses.

The processing of project briefs is briefly summarized in the tabulation shown below. Figures for the current and previous reporting periods are shown to facilitate comparison.

	<u>Project Briefs Processed</u>	
	1 Aug. 1964 31 July 1965	1 Aug. 1965 31 July 1966
Briefs Published on New Programs	268	233
Revisions Published	<u>636</u>	<u>676</u>
Total Processed	904	909

The number of project briefs published on new programs during the current reporting period has decreased somewhat from the number published during the previous year. This drop may be due to the fact that some IAPG member agencies have experienced recent cut-

backs in their nonpropulsive power research and development programs.

The number of revisions published during the current year shows a gratifying increase over the previous reporting period. This indicates that communications between the various project engineers who furnish the data and the PIC has improved. There are, however, several organizations whose project engineers have not furnished any updating information on some of their programs during the past year.

The PIC maintains detailed suspense files on all active IAPG programs and requests updating information on all programs at six month intervals. These requests are sent directly to the project engineers of the agencies sponsoring the research. Response to these updating requests has been good with the exceptions previously cited.

Technical Publications

The IAPG is committed by its charter to provide for the wide dissemination of information in the advanced nonpropulsive power field to government and certain nongovernment organizations. This function is accomplished through the medium of the project briefs previously described and through symposia sponsored by the various IAPG Working Groups and Panels. The PIC administratively supports such meetings and collects, edits, reproduces, collates and selectively distributes bound volumes of the proceedings. These volumes are produced in limited quantities to meet an initial distribution requirement. To assure wider dissemination, the PIC furnishes copies to the Defense Documentation Center for distribution to qualified requesters.

During this reporting period, the PIC published and selectively distributed the numbered technical publications that are listed below:

<u>PIC Number</u>	<u>Title</u>	<u>Total Pages</u>	<u>No. of Line Drawings</u>	<u>No. of Half Tones</u>
	Proceedings of the Fifth Photovoltaic Specialists Conference:			
PIC-SOL 209/6	Volume I-Advanced Solar Cells	255	95	17
PIC-SOL 209/6.1	Volume II-Thin Film Solar Cells and Radiation Damage	281	113	5
PIC-SOL 209/6.2	Volume III-Solar Power System Considerations	135	40	3
PIC-BAT 209/9	Study Papers on the Auxiliary Electrode	87	34	7

During the past year, the PIC has been called upon to reprint technical documents that had been previously published by others. In the main, these reprints are used in support of a technical meeting sponsored by an IAPG Working Group. All of the documents listed below are reprints and, with the exception of the last publication, are being used as background information by the individuals who will attend the conference on The Potential of Primary Fuel Cells as Power Plants for Terrestrial Vehicles.

<u>Title</u>	<u>Total Pages</u>	<u>No. of Line Drawings</u>	<u>No. of Half Tones</u>
California Research Corporation:			
Special Report #1	34		
Special Report #2, Part 1	62		
Special Report #2, Part 2	177		
USAERDL Special Reports:			
Fuel Cells, Present Status and Development Problems	44	15	11
Application of Fuel Cell Power Plants to Electrical Drive Systems	12		
Energy Sources for Electrically Powered Automobiles	8		
Laboratory Methods for Determining Non-Time Dependent Reliability	22	4	

Other Publications

In addition to the technical publications discussed above, the PIC, in performing its secretariat function, publishes and distributes numerous other documents that vary from a single page to multipage documents of considerable length. The publication numbers, titles and dates of issue of these documents is included as Exhibit B of this report.

Meetings and Conferences

During this reporting period, the IAPG organizations held a total of eighteen meetings. These meetings, the locations, dates and the number of PIC personnel attending is included as Exhibit C of this report. It is gratifying to note that all IAPG groups held at least one meeting during this period. It is interesting to note that the Electrical Working Group established an Ad Hoc Panel on Power Conditioning. In the event this Panel becomes formally organized, it would be safe to assume that the number of IAPG meetings will increase in the future.

Correspondence Processed

The PIC handles a considerable volume of correspondence with the IAPG member agencies and other government groups, and as the IAPG Secretariat the PIC corresponds with nongovernment organizations also.

During the period covered by this report, the volume of correspondence with the IAPG and other government groups was 1,648 pieces. This figure corresponds to the average volume of the past five years.

The number of pieces of mail exchanged with nongovernment organizations was 864. This too represents the near average of the past

five years.

It should be kept in mind that the PIC has a very heavy mailing load in conjunction with the dissemination of project briefs. This is not included under the correspondence work load.

Postal Expenditures

Postal expenditures for this reporting period amounted to \$4,028.52. This is slightly below the expenditure of \$4,194.96 that was expended during the previous reporting period. All mailings are made at the lowest possible rates, but it is well known that rates on third and fourth class mail, which form the bulk of the PIC mailings, have been increased and may go higher.

Telephone Expenditures

The telephones at the PIC are used only for priority communications and only a few persons are authorized to place toll calls. The sum of \$719.86 was spent for telephone service during the current reporting period. This is somewhat higher than the \$674.05 that was spent in the previous reporting period.

Printing Operations

An information exchange service must be in a position to effect the speedy reproduction and dissemination of data otherwise the service is ineffective. This is particularly true in the processing, reproduction and mailing of project brief information.

The PIC has full control over its reproduction facilities which are staffed by PIC personnel. This assures adequate control and permits the establishment of priorities, quality control, and the timely processing of all reproduction work.

A summary, on a monthly basis, of the reproduction activities

at the PIC is included as Exhibit D. The total number of impressions produced during this reporting period is approximately twelve percent below the previous years production which was at an all time high.

The reduction in this area of activity is attributable primarily to the fact that the PIC published fewer bound volumes during this reporting period.

Machine Accounting Operations

In order to facilitate operations and reduce the clerical work load, the PIC leases certain IBM equipment. This equipment consists of a keypunch machine, a sorter, and a cardatype machine together with the necessary plugboards, wiring and card file equipment. This operation is manned by the equivalent of one man year of supervisory and part-time staff augmented as required by clerical help from other elements within the PIC. Exhibit E depicts the activities of this operation.

The machine accounting operation makes it possible to perform the following functions more rapidly and more accurately than if they were performed manually:

1. The maintenance of the IAPG mailing list and the publication of this list quarterly.
2. The production, in quantity and as required, of the necessary mailing labels so that published information may be mailed expeditiously.
3. The maintenance and the periodic publication of the IAPG membership rosters.
4. The maintenance and the publication of the two-way project brief index which is distributed four times each year. Special

data are also produced as required for use at Working Group and Panel program review meetings.

5. The maintenance of an up-to-date file of the administrative information contained in the published project briefs.

6. The maintenance of a current inventory record of all classified material at the PIC.

7. In addition to the normal operations handled by PIC, a system is being developed whereby its operations may be converted to the 1401/360 Computers. In addition to the PIC staff who are working on this problem, the Institute for Cooperative Research has assisted with 16 hours of program time, by a research fellow, four hours of computer use, and 16 hours for the administration and analysis of this work by a research specialist. A preliminary survey of this changeover has been made and submitted to PIC. The purpose of this study is to determine the feasibility of performing the machine accounting functions of the PIC by a computer. The cost of computer operations and accessibility to the computer on a time-shared basis will be developed. The present IBM equipment is very flexible and is under direct PIC control. Moreover, recent negotiations with the IBM Corporation have resulted in a modest reduction in the rental and service charges on the equipment in current use. Unless the above mentioned study reveals substantial advantages in converting to computer operations, the PIC will continue to operate with the equipment now in use.

Maintenance of the IAPG Mailing List

The IAPG mailing list is under the control of the Steering Group members. The PIC, however, keeps the list current and publishes a revised list quarterly for distribution to the Steering Group and

to the Working Group Chairmen.

At the end of this reporting period, this list contained 723 separate addresses. These addresses include 158 IAPG roster members, 7 observers, 139 other government offices and 419 nongovernment organizations.

Each year, during the month of May, the PIC updates the non-government portion of the mailing list. This accounts for the large number of address changes for the month of May as illustrated in Exhibit F. It should be remembered that all additions, address changes and deletions involved in the list cause corresponding changes in mailing labels.

Monthly Expenditures During the Sixth Operating Year

Expenditures on the PIC contract are summarized on a monthly basis in Exhibit G. The PIC contract, NASr-191, is administered by the Office of Grants and Research Contracts of the National Aeronautics and Space Administration in Washington. The Army, the Navy, the Air Force and the Atomic Energy Commission as well as the NASA contribute equally to the support of the PIC contract.

The basic contract has been amended to continue the operation of the PIC through 31 July 1967. Additional funds were made available for this purpose.

It will be noted that the PIC is operating consistently below initial projections. This is due primarily to the fact that the allowable overhead and employee benefits have been substantially reduced in recent years. These overhead charges are reviewed annually through negotiations between the government and the university. It is difficult to predict what these charges will be in the future

because experience has shown that they can be increased as well as reduced.

Direct labor costs on the other hand will be increased in line with national and local salary trends. These increases are necessary to allow for adequate staffing of the PIC.

OPERATIONAL PROBLEMS

Inasmuch as the published project brief is the primary means by which the IAPG and the PIC discharge their information exchange function, there appears to be considerable room for improvement in this area. Specifically, this improvement should be sought in the following ways:

1. The prompt reporting to the PIC of information on all new programs whether contractual or in-house. The PIC is not in a good position to learn of the existence of new programs in the nonpropulsive power field.

2. A method should be devised to identify those portions of systems developments that are in the field of advanced nonpropulsive power. Such information should be reported to the PIC.

3. The periodic updating (every six months) of information on existing programs is essential. In this area considerable progress has been made, but there are IAPG member organizations that have not revised their programs for more than two years and have repeatedly ignored requests from the PIC for updating information.

4. A feeling is developing among certain working group personnel that it is not wise to reveal funding data in the published project briefs. This matter came up for discussion during the 2 June 1966 meeting of the Electrical Working Group. Representatives of

the PIC pointed out that the format of the project brief was approved by the Steering Group and that fiscal data on contracts is required. Moreover, such information is available from other sources, hence it is in the "public domain". Despite this fact, project brief data on some programs has been renewed without any fiscal information.

Recommendations

In light of the above, the following recommendations are offered for further consideration:

1. That IAPG member agencies develop improved reporting to the PIC to cover new programs, advanced nonpropulsive power developments of systems programs and the updating of existing programs.
2. The Steering Group resolve the matter cited in (4) above to assure uniform reporting of information contained in the published project briefs.

KEY PERSONNEL

1. Research Coordinator - Paul S. Balas

Mr. Balas holds a B.S. in Electrical Engineering and a B.S. in Management Engineering from Carnegie Institute of Technology and an M.B.A. degree from the University of Pennsylvania. He has had several years of industrial experience as an engineer. Mr. Balas joined the PIC staff on 1 September 1960 and has been Director of the PIC since 20 August 1963.

2. Research Coordinator - F. Earl Williams

Mr. Williams holds a B.S. and an M.S. degree from the University of Massachusetts. He has had extensive experience in secondary school administration and in secretariat type operation. He joined the PIC staff on 1 November 1961.

3. Research Coordinator - Robert F. Ashleigh

Mr. Ashleigh holds a B.A. degree from Dartmouth College and an M.S. in Ed. from the University of Pennsylvania. Mr. Ashleigh joined the PIC staff in December 1960, and left the organization on 15 April 1966.

4. Research Coordinator - Murray S. Force

Mr. Force holds an A.B. degree from the University of South Dakota and an M.A. degree from the University of Missouri. Mr. Force rejoined the PIC staff on 15 June 1966 after an absence of four years. During these four years, Mr. Force served on the faculties of Upper Iowa University and Wilkes College.

5. Chief, Support Group and Business Manager - Barbara D. Ross

Mrs. Ross holds an A.B. from Barnard College and an M.S. from the University of Pennsylvania. She has had broad experience including

instructor, Wharton School, University of Pennsylvania, and Government Civil Service as a statistician. Mrs. Ross has been with the PIC since 1 August 1960.

6. Chief, Machine Accounting Operations - Elizabeth J. Geary

Miss Geary received her B.A. degree from the University of Pennsylvania. She has had over twenty years experience in automatic data processing and has been directly involved in PIC operations since September 1960.

INTERAGENCY ADVANCED POWER GROUP

EXHIBIT A

PROJECT BRIEF

SAMPLE

PIC Number: 1431

Working Group:	Code(Field of Interest):	Program Initiation Date:	Revision Number: 1
Electrochemical	C-EC	April 1965	Issue Date: June 1966

Title: High-Performance Light-Weight Electrode System for
Primary Hydrogen-Oxygen Fuel Cells

Contractor (Name and Address):
(Or indicate Internal)

American Cyanamid Company
Central Research Division
1937 West Main Street
Stamford, Conn. 06904

Telephone: 203-348-7331

Principal Investigator: Dr. R. G. Haldeman

Directing Agency, Organization, and Address:

NASA-Lewis Research Center
21000 Brookpark Road (MS 500-201)
Cleveland, Ohio 44135

Telephone: 216-433-4000, ext. 6639

Project Engineer: M. R. Unger

Current Contract Number:

NAS3-6477

Agency Identification Number:

Current Contract Period:

April 1965 to April 1966

Probable Project Completion Date:

Continuing

End Item:

Reports

Related Projects:

PIC 938

Contract Funding:

Source:

FY 65 \$ 94,753

NASA

FY ___ \$

FY ___ \$

FY ___ \$

FY ___ \$

Internal Man-Years

FY ___ Man-Years

FY ___ Man-Years

FY ___ Man-Years

FY ___ Man-Years

FY ___ Man-Years

Description: High performance, light-weight electrode systems development for hydrogen-oxygen matrix fuel cells will be performed investigating the following operating variables over the ranges shown:

Current density:

100 to 1000 mA/cm²

Temperature:

100 to 200°C

Pressure:

0 to 60 psig

Electrolyte (KOH) concentration: 30 weight percent to the solubility limit

Electrolyte loading:

Variable depending on matrix

Reactant moisture content:

0 to 90% saturated with respect to cell conditions.

Short-term (70 hours) and long-term (1200 hours) operation will be conducted in experimental laboratory fuel cells (2 inch by 2 inch size). Verification of optimum initial performance and long-term performance will be conducted in 6 inch by 6 inch battery size cells.

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SAMPLE

SAMPLEEXHIBIT A

PIC Number 1431

Status: June 1966

(November 1965 to February 1966)

Proprietary Ceria - PTFE matrices containing 86% ceria by weight were evaluated. These matrices are 9 mils thick and have 72-77% total voids. The results of the evaluation are summarized as follows:

Resistivity:	2 ohm-cm at 100°C and 50% KOH
Bubble pressure:	16-20 psig
Corrosion:	Weight loss of 4%, at 150°C, in 70% KOH, after 900 hours
	Weight loss of 27% at 200°C, in 75% KOH, after 380 hours

The Ceria-PTFE matrix has a combination of low resistivity and high bubble pressure superior to that of any of the asbestos matrices evaluated thus far in this contract effort. This gives it a potential performance advantage over these asbestos matrices for operation under pressure and temperatures substantially above 100°C. The approximate maximum temperature suitable for asbestos matrices is 100°C. Preliminary results of short term tests with Ceria-PTFE matrices were sufficiently encouraging such as to include them in the life testing program.

Life tests were run in 2 inch cells at 100°C and atmospheric pressure. Stable performance (decline less than 4mV/100 hours) was obtained for more than 1200 hours at a current density of 100mA/cm², using either ACCO I Asbestos or Fuel Cell Asbestos as the matrix. Quinterra Asbestos has yielded stable performance for at least 429 hours. Cell voltages at 100 mA/cm² were generally in the range of 0.92 to 0.94 volts.

Stable performance was also achieved for more than 1200 hours at 300mA/cm² with ACCO I Asbestos as the matrix. Cell voltages were mostly 0.86 to 0.88 volts. ACCO II Asbestos and Fuel Cell Asbestos have not yet yielded stable performance at 300mA/cm².

Testing of a 6 inch cell was conducted at 100°C, 50% KOH, and atmospheric pressure. The removal of product water simulated that of a battery system with a recycle hydrogen stream and dead-ended oxygen. Stable performance was achieved at 300mA/cm² for 740 hours at a voltage of 0.85-0.87 volts, and a voltage decline rate of 1.2mV/100 hours.

MSF/bl

SAMPLE

LIST OF PUBLICATIONSAGENDA OF MEETINGS AND SYMPOSIA

PIC 2/14	IAPG Steering Group	10 Sept. 1965
PIC 2/15	IAPG Steering Group	17 March 1966
PIC-BAT 2/15	Electrochemical Working Group	8 Feb. 1966
PIC-ELE 2/4	Electrical Working Group	2 May 1966
PIC-ELE-MHD 2/2	Electrical Working Group MHD Panel	4 Feb. 1966
PIC-ELE-TE 2/2	Electrical Working Group-Thermoelectric Panel	7 Oct. 1965
PIC-ELE-TE 2/3	Electrical Working Group-Thermoelectric Panel	15 Feb. 1966
PIC-ELE-TE 2/4	Electrical Working Group-Thermoelectric Panel	9 May 1966
PIC-ELE-TI 2/8	Electrical Working Group-Thermionic Panel	2 Nov. 1965
PIC-ELE-TI 2/9	Electrical Working Group-Thermionic Panel	28 Jan. 1966
PIC-MEC 2/7	Mechanical Working Group	11 Oct. 1965
PIC-MEC 2/8	Mechanical Working Group	14 March 1966
PIC-NUC 2/8	Nuclear Working Group	14 April 1966
PIC-SOL 2/9	Solar Working Group	Sept. 1965
PIC-SOL 2/10	Solar Working Group	27 Jan. 1966

MINUTES OF MEETINGS

PIC 3/14	IAPG Steering Group	18 Oct. 1965
PIC 3/15	IAPG Steering Group	29 April 1966
PIC-BAT 3/15	Electrochemical Working Group	5 April 1966
PIC-ELE 3/4	Electrical Working Group	17 June 1966
PIC-ELE-MHD 3/2	Electrical Working Group MHD Panel	25 March 1966
PIC-ELE-TE 3/1	Electrical Working Group-Thermoelectric Panel	16 Sept. 1965

EXHIBIT BMINUTES OF MEETINGS (continued)

PIC-ELE-TE 3/2	Electrical Working Group-Thermoelectric Panel	29 Nov. 1965
PIC-ELE-TE 3/3	Electrical Working Group-Thermoelectric Panel	30 March 1966
PIC-ELE-TE 3/4	Electrical Working Group-Thermoelectric Panel	24 June 1966
PIC-ELE-TI 3/8	Electrical Working Group-Thermionic Panel	2 Dec. 1965
PIC-ELE-TI 3/9	Electrical Working Group-Thermionic Panel	14 March 1966
PIC-MEC 3/7	Mechanical Working Group	Nov. 1965
PIC-MEC 3/8	Mechanical Working Group	27 April 1966
PIC-NUC 3/8	Nuclear Working Group	31 May 1966
PIC-SOL 3/9	Solar Working Group	Sept. 1965
PIC-SOL 3/10	Solar Working Group	23 March 1966

ROSTERS OF MEMBERS

PIC 92/21	IAPG Membership	Sept. 1965
PIC 92/22	IAPG Membership	Jan. 1966
PIC 92/23	IAPG Membership	April 1966
PIC 92/24	IAPG Membership	July 1966

ORGANIZATION AND PROCEDURE

PIC-OP	Operating Manual	May 1966
PIC 119/1.6	Information Brochure-Government	Oct. 1965
PIC 119/1.7	Information Brochure-Government	April 1966
PIC 233/74 through PIC 233/95	IAPG Project Brief Status Changes	30 Aug. 1965 through 22 July 1966
PIC 259/18	IAPG General Mailing List	Sept. 1965
PIC 259/19	IAPG General Mailing List	Dec. 1965

EXHIBIT BORGANIZATION AND PROCEDURE (continued)

PIC 259/20	IAPG General Mailing List	March 1966
PIC 259/21	IAPG General Mailing List	June 1966

ANNOUNCEMENTS AND NOTICES

PIC 244/50	Accompanying Joe Sherfey's letter of Electrochemical Working Group Invitees	2 Aug. 1965
PIC 244/51	Announcing Fifth Photovoltaic Specialists Conference	5 Aug. 1965
PIC 244/52	Cancelling 23 September 1965 Electrochemical Working Group Meeting	30 Aug. 1965
PIC 244/53	Announcing 30-31 March 1966 Electrochemical Working Group Meeting	5 Nov. 1965
PIC 244/54	Accompanying PIC 228/5	7 Jan. 1966
PIC 244/55	Accompanying Reprint on Reliability Engineering (Picatinny Arsenal-June 1965)	6 June 1966

ATTACHMENTS TO MINUTES

PIC 210.1/47	Report of Outgoing Chairman	11 Oct. 1965
PIC 210.1/48	Report on Electrochemical Working Group Chairman	11 Oct. 1965
PIC 210.1/49	Report of Electrochemical Working Group Chairman	22 April 1966
PIC 210.1/50	Report of the Nuclear Working Group Chairman	22 April 1966
PIC 210.1/51	Report of Key Work Ad Hoc Group Meeting	22 April 1966
PIC 210.1/52	IAPG Information Exchange Tabulation	22 April 1966
PIC-MEC 210.1/1	Transfer of Technology to Component Development (Dr. Earl Quandt)	10 Nov. 1965
PIC-MEC 210.1/2	Reliability of Electrochemical Devices (George Chernowitz)	10 Nov. 1965
PIC-SOL 210.1/3	Sample Format for Reporting Solar Program Data	15 Sept. 1965

EXHIBIT BATTACHMENTS TO MINUTES (continued)

PIC-SOL 210.1/4 NRL Program Summary 4 March 1966

INDEXES OF PROJECT BRIEFS

PIC 228/5	Completed and Cancelled Briefs as of 31 December 1965	Jan. 1966
PIC 229.2/15	Project Brief Index by Working Group	Sept. 1965
PIC 229.2/16	Project Brief Index by Working Group	Jan. 1966
PIC 229.2/17	Project Brief Index by Working Group	April 1966
PIC 229.2/18	Project Brief Index by Working Group	June 1966
PIC 229.3/7	Active IAPG Project Briefs by Field of Interest	Sept. 1965
PIC 229.3/8	Active IAPG Project Briefs by Field of Interest	Jan. 1966
PIC 229.3/9	Active IAPG Project Briefs by Field of Interest	April 1966
PIC 229.3/10	Active IAPG Project Briefs by Field of Interest	June 1966

Meetings and Conferences During 1 August 1965-31 July 1966

<u>Meeting</u>	<u>Location</u>	<u>Date(s)</u>	<u>PIC Personnel Attending</u>
Solar Working Group	Washington, D. C.	9 September 1965	2
Photovoltaic Planning Conference	Washington, D. C.	10 September 1965	1
Thermoelectric Panel	PIC, Phila., Pa.	14 September 1965	2
Steering Group	PIC, Phila., Pa.	7 October 1965	2
Photovoltaic Specialist Conference	Greenbelt, Md.	18-20 October 1965	2
Mechanical Working Group	Annapolis, Md.	9 November 1965	2
Thermoelectric Panel	Germantown, Md.	17 November 1965	2
Thermionic Panel	PIC, Phila., Pa.	30 November 1965	2
Solar Working Group	PIC, Phila., Pa.	3 March 1966	2
Thermionic Panel	Cleveland, Ohio	9 March 1966	2
MHD Panel	Cleveland, Ohio	9 March 1966	2
Thermoelectric Panel	Harrison, N. J.	18 March 1966	2
Electrochemical Work. Gp.	PIC, Phila., Pa.	30-31 March 1966	2
Mechanical Working Group	PIC, Phila., Pa.	13 April 1966	2
Steering Group	PIC, Phila., Pa.	21 April 1966	2
Nuclear Working Group	Germantown, Md.	19 May 1966	2
Electrical Working Group	PIC, Phila., Pa.	2 June 1966	2
Thermoelectric Panel	Germantown, Md.	8 June 1966	2
*Power Sources Conference	Atlantic City, N. J.	24-26 May 1966	1

*Although not an IAPG conference, the PIC sent a representative.

EXHIBIT C

PIC PRINTING PRODUCTION SUMMARY

Month	Form 3	Other	Total	Masters	No. of Form 3 Impressions	No. of Other Impressions	Total No. of Impressions
August 1965	73	24	97	212	111,005	8,725	119,730
Sept. 1965	82	18	100	327	120,165	51,275	171,440
Oct. 1965	44	30	74	252	69,000	23,630	92,630
Nov. 1965	60	24	84	280	97,500	26,320	123,820
Dec. 1965	89	20	109	499	146,840	63,805	210,645
Jan. 1966	59	41	100	537	92,720	140,605	233,325
Feb. 1966	120	33	153	480	185,930	85,346	271,276
Mar. 1966	122	28	150	390	192,140	11,755	203,895
Apr. 1966	66	30	96	283	106,175	51,863	158,038
May 1966	59	33	92	216	103,850	7,800	111,650
June 1966	82	25	107	404	132,500	38,750	171,250
July 1966	30	15	45	329	47,740	24,515	72,255
Totals	886*	321	1207	4209	1,405,565	534,389	1,939,954

*Excludes 23 Form 3's printed in July 1965 but not distributed until August 1965.

EXHIBIT D

EXHIBIT E

PIC

IBM Equipment Utilization

1 August 1965 through 31 July 1966

<u>Month</u>	<u>Program Development Hours</u>	<u>Keypunch Hours</u>	<u>Shorter Hours</u>	<u>Cardatype Hours</u>
August	82	84	7	80
September	105	35	7	76
October	149	24	8	74
November	143	21	4	65
December	125	6	4	37
January	105	27	6	53
February	112	38	15	50
March	104	28	12	73
April	104	44	5	46
May	89	19	10	64
June	98	19	6	81
July	<u>85</u>	<u>37</u>	<u>8</u>	<u>75</u>
Total	1301	382	92	774

EXHIBIT F

IAPG MAILING LIST MAINTENANCE

<u>Month</u>	<u>Additions</u>	<u>Changes</u>	<u>Deletions</u>	<u>Total</u>
August 1965	6	61	6	73
September	1	6	1	8
October	9	5	12	26
November	5	18	2	25
December	4	5	1	10
January 1966	15	6	8	29
February	4	7	2	13
March	16	6	3	25
April	5	10	6	21
May	7	141	12	160
June	5	4	1	10
July	<u>8</u>	<u>51</u>	<u>13</u>	<u>72</u>
Totals	85	320	67	472*

*This number does not represent the total number of addresses on the list, but it does reflect the number of times the mailing list was changed.

EXHIBIT G

Monthly Expenditures

From 1 August 1965 - 31 July 1966

Contract Funds for Four Year Operation \$502,581.71

Expended:

August 1965	\$ 6,199.50	
September 1965	8,263.56	
October 1965	10,153.04	
November 1965	8,190.86	
December 1965	9,083.69	
January 1966	9,831.78	
February 1966	9,378.03	
March 1966	10,101.63	
April 1966	8,858.45	
May 1966	9,911.00	
June 1966	7,438.53	
July 1966*	<u>12,755.15</u>	
Expended Third Year*	\$ 110,165.22	
Expended First Two Years	219,408.07	
Expended in Three Years*		<u>\$329,573.29</u>
Indicated Carryover*		\$173,008.42

*Estimated. July 1966 expenditures not available at the time report was prepared.